

# International Journal of COMPUTER AND INFORMATION SCIENCES

## Volume 14, 1985

*International Journal of Computer and Information Sciences* publishes (1) high-quality, definitive, original articles that have been appropriately reviewed by competent scientific workers, (2) reviews of recent developments in the field, and (3) tutorial and expository papers covering specific areas of interest and applications of computer and information sciences. The journal aims to provide a forum for research workers and students in the field and to expedite communication between them and other scientists interested in applications. We believe that the journal will be read by those with a common interest in computer and information sciences but from diverse backgrounds, such as engineering, mathematics, statistics, physics, chemistry, management science, psychology, biomedical science, and behavioral science. Emphasis is placed upon both theoretical and experimental work that is of deep conceptual significance. The scope of the journal includes: software engineering; systems programming; pattern recognition; picture processing; computer graphics; information evaluation; computer organization; language processing; automata theory; mathematical linguistics; computer architecture; data structure and access; management information systems; biomedical information processing.

### TOR-IN-CHIEF

**James T. Tou**  
Director, Center for Information Research, University of Florida, Gainesville, Florida

### TORIAL BOARD

- |   |   |
|---|---|
| <b>W. Backus</b> , IBM Corporation, San Jose, California                      | <b>Robert McNaughton</b> , Rensselaer Polytechnic Institute, Troy, New York |
| <b>Robert S. Barton</b> , Burroughs Corporation, Paoli, Pennsylvania          | <b>Saburo Muroga</b> , University of Illinois, Urbana, Illinois             |
| <b>Thomas E. Cheatham, Jr.</b> , Harvard University, Cambridge, Massachusetts | <b>Jin-ichi Nagumo</b> , University of Tokyo, Tokyo, Japan                  |
| <b>C. Chen</b> , IBM Corporation, San Jose, California                        | <b>C. V. Ramamoorthy</b> , University of California, Berkeley, California   |
| <b>Gold P. Edmundson</b> , University of Maryland, College Park, Maryland     | <b>J. C. Simon</b> , Université de Paris, Paris, France                     |
| <b>S. Fu</b> , Purdue University, Lafayette, Indiana                          | <b>V. K. Smirnov</b> , Academy of Sciences, Moscow, USSR                    |
| <b>C. Gonzalez</b> , University of Tennessee, Knoxville, Tennessee            | <b>Daniel Teichroew</b> , University of Michigan, Ann Arbor, Michigan       |
| <b>Robert Grenader</b> , Brown University, Providence, Rhode Island           | <b>W. M. Turski</b> , Warsaw University, Warsaw, Poland                     |
| <b>G. Ivakhnenko</b> , Ukrainian Academy of Science, Kiev, USSR               | <b>W. L. van der Poel</b> , Technische Hogeschool, Delft, The Netherlands   |
| <b>Robert Kuck</b> , University of Illinois, Urbana, Illinois                 | <b>Michael S. Watanabe</b> , University of Hawaii, Honolulu, Hawaii         |
| <b>Lukaszewicz</b> , Academy of Sciences, Warsaw, Poland                      | <b>Peter Wegner</b> , Brown University, Providence, Rhode Island            |
| <b>James H. McCormick</b> , University of Illinois, Chicago, Illinois         | <b>Maurice V. Wilkes</b> , University of Cambridge, Cambridge, England      |

Published bimonthly at Tempelhof 41, 8000 Bruges, Belgium, by Plenum Publishing Corporation, 233 Spring Street, New York, N.Y. 10013. In 1985, Volume 14 (6 issues) will be published. Subscription orders should be addressed to the publisher. *International Journal of Computer and Information Sciences* is abstracted or indexed by Applied Mechanics Reviews; Chemical Abstracts; Chemical Titles; Computer and Information Systems Abstracts Journal; Current Contents; Engineering Index; INSPEC—Computer and Control Abstracts, Electronics and Electronics Abstracts, and Electronics Abstracts; Management Contents; Mathematical Reviews; Matematicheskii Zhurnal; Science Citation Index; and Sociological Abstracts. © 1985 Plenum Publishing Corporation. *International Journal of Computer and Information Sciences* participates in the Copyright Clearance Center (CCC) Transactional Reporting Service. The appearance of a code line at the bottom of the first page of an article in this journal indicates the copyright owner's consent that copies of the article may be made for personal or internal use. However, this consent is given on the condition that the copier pay the flat fee of \$4.50 per copy per article (no additional per-page fees) directly to the Copyright Clearance Center, Inc., 27 Congress Street, Salem, Massachusetts 01970, for all copying not explicitly permitted by Sections 107 or 108 of the U.S. Copyright Law. The CCC is a nonprofit clearinghouse for the payment of photocopying fees by libraries and users registered with the CCC. Therefore, this consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale, nor to the reprinting of figures, tables, and text excerpts. 0091-7036/85 \$4.50

### Subscription rates:

Volume 14, 1985 (6 issues) \$195.00 (outside the U.S., \$218.00).  
Volume 15, 1986 (6 issues) \$195.00 (outside the U.S., \$218.00). Price for individual subscribers certifying that the journal is for their personal use, \$60.00 (outside the U.S., \$69.00).

Second-class postage paid at Jamaica, N.Y. 11431. Postmaster: Send address changes to *International Journal of Computer and Information Sciences*, Plenum Publishing Corporation, 233 Spring Street, New York, N.Y. 10013. Freight and mailing in the USA by Publications Expediting, Inc., 200 Meacham Avenue, Elmont, N.Y. 11003.

Printed in Belgium.

Published bimonthly at Tempelhof 41, 8000 Bruges, Belgium, by Plenum Publishing Corporation, 233 Spring Street, New York, N.Y. 10013. In 1985, Volume 14 (6 issues) will be published. Subscription orders should be addressed to the publisher. *International Journal of Computer and Information Sciences* is abstracted or indexed in Applied Mechanics Reviews; Chemical Abstracts; Chemical Titles; Computer and Information Systems Abstracts Journal; Current Contents; Engineering Index; INSPEC—Computer and Control Abstracts, Electrical and Electronics Abstracts, and Electronics Abstracts; Management Contents; Mathematical Reviews; Referativnyi Zhurnal; Science Citation Index; and Sociological Abstracts. © 1985 Plenum Publishing Corporation. *International Journal of Computer and Information Sciences* participates in the Copyright Clearance Center (CCC) Transactional Reporting Service. The appearance of a code line at the bottom of the first page of an article in this journal indicates the copyright owner's consent that copies of the article may be made for personal or internal use. However, this consent is given on the condition that the copier pay the flat fee of \$4.50 per copy per article (no additional per-page fees) directly to the Copyright Clearance Center, Inc., 27 Congress Street, Salem, Massachusetts 01970, for all copying not explicitly permitted by Sections 107 or 108 of the U.S. Copyright Law. The CCC is a nonprofit clearinghouse for the payment of photocopying fees by libraries and other users registered with the CCC. Therefore, this consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale, nor to the reprinting of figures, tables, and text excerpts. 0091-7036/85 \$4.50



# International Journal of COMPUTER AND INFORMATION SCIENCES

Vol. 14, No. 1

February 1985

---

## CONTENTS

Schema Manipulation in Self-Describing and Self-Documenting Data Models	1
<i>Nick Roussopoulos and Leo Mark</i>	
Modeling of Multiple Copy Update Costs for File Allocation in Distributed Databases	29
<i>Amitava Dutta</i>	
Syntactic Monoids in the Construction of Systolic Tree Automata	35
<i>H. Jürgensen and A. Salomaa</i>	
Architectural Support for Variable Addressing in Ada— A Design Approach	51
<i>Prasenjit Biswas and Subrata Dasgupta</i>	

---

# International Journal of COMPUTER AND INFORMATION SCIENCES

Vol. 14, No. 2

April 1985

---

## CONTENTS

Multidimensional Extendible Hashing for Partial-Match Queries <i>Shou-Hsuan Stephen Huang</i>	73
BPL: A Set-Based Language for Distributed System Prototyping <i>James W. Hooper</i>	83
A Complexity Measure for Data Flow Models <i>Howard E. Motteler and Carl H. Smith</i>	107

---

# International Journal of COMPUTER AND INFORMATION SCIENCES

Vol. 14, No. 3

June 1985

---

## CONTENTS

Knowledge Engineering Revisited <i>Julius T. Tou</i>	123
An Empirical Performance Comparison of Some Variations of the <i>k-d</i> Tree and <i>BD</i> Tree <i>Sivarama P. Dandamudi and Paul G. Sorenson</i>	135
A Transportable Programming Language (TPL) System. I. Overview <i>P. A. D. de Maine, S. Leong, and C. G. Davis</i>	161
Finding Minimal Enclosing Boxes <i>Joseph O'Rourke</i>	183

---

# International Journal of COMPUTER AND INFORMATION SCIENCES

Vol. 14, No. 4

August 1985

---

## CONTENTS

An Evolutionary Procedure for Machine Learning	201
<i>Leonard D. Mlodinow and Ion O. Stamatescu</i>	
A Note on the Method of Puzzles for Key Distributions	221
<i>Becky Chan and Henk Meijer</i>	
LL(1) Grammars and Sub-LL(1) Grammars	225
<i>Chen Jinhua</i>	
A Note on Regular-Controlled Apical-Growth Filamentous Systems	235
<i>K. G. Subramanian</i>	

---

# International Journal of COMPUTER AND INFORMATION SCIENCES

Vol. 14, No. 5

October 1985

---

## CONTENTS

An Analysis of Self-Diagnosis Model by Conditional Fault Set <i>Y. Ishida, N. Adachi, and H. Tokumaru</i>	243
A Class of Systolic Multiplier Units for VLSI Technology <i>A. R. Hurson and B. Shirazi</i>	261
Towards Formal Specification of a Distributed Computing System <i>V. K. Agrawal, L. M. Patnaik, and P. S. Goel</i>	277
A Partially Distributed Deadlock Detection Algorithm <i>Ahmed K. Elmagarmid, Amit P. Sheth, and Ming T. Liu</i>	307

---



# International Journal of COMPUTER AND INFORMATION SCIENCES

Vol. 14, No. 6

December 1985

---

## CONTENTS

Important Announcement	331
Editorial Announcement	333
Editorial: A Time of Transition <i>Gary Lindstrom</i>	335
Minimal Covering Problem and PLA Minimization <i>Ming Huei Young and Saburo Muroga</i>	337
An Approach to Computer-Aided Document Examination <i>D. Brzakovic and J. T. Tou</i>	365
On Serializability <i>J. A. Brzozowski and S. Muro</i>	387
Optimal Taxiway Repair: A Set-Covering Approach <i>R. Michael Harnett and Gary C. Kiel</i>	405
AE1: An Extension Matrix Approximate Method for the General Covering Problem <i>Jiarong Hong</i>	421
Trace Confirmation with Given Object Position <i>S. K. Chang, Bingwei Luo, C. C. Yang, and Mark C. K. Yang</i>	439
A Parallel Sorting Scheme Whose Basic Operation Sorts $N$ Elements <i>S. S. Tseng and R. C. T. Lee</i>	455

---